

B. V. SKVORTZOV* and Mitsuzo NODA**: **On Brazilian and European species of genus *Vacuolaria***

スクボルツォフ・ビー・ブイ*・野田光蔵**: ブラジルおよび
ヨーロッパ産の *Vacuolaria*
(Euglenophyta, Chloromonadaceae)

A large flagellata with typical yellow green small chloroplasts, large oil drops, numerous refractory granules under the periplast and 2 flagella was recorded in Sao Paulo waters by the senior author of the present paper in 1962. During the last 5 years (1962–1966) this flagellata, belonging to genus *Vacuolaria* Cienk., was observed many times, especially in winter cooler period of the year. Thousands of living individuals of *Vacuolaria*, swimming and resting in gelatine envelopes were studied. Brazilian specimens of *Vacuolaria* are different from the species reported from Europe, as *Vacuolaria viridis*, *V. virescens* and *V. latviensis*. According to the letter from Prof. Bohuslav Fott in Praha received in 1965, *Vacuolaria* is widespread in all Europe, but each species grows only on special localities, for example, *V. virescens* in acid bogs, *V. viridis* in small ponds with neutral water. Diversity of environment has been overlooked, writes Prof. Bohuslav Fott., because the specimens has been studied in fixed state.

Here are given the localities of Sao Paulo, where *Vacuolaria* was studied:

1. Sao Paulo, along River Pinheiros in a polluted lake. Col. by B. Skvortzov and C. Lima, 18, 1. '63.
2. Sao Paulo, Parque do Estado, in a pond among twigs of *Utricularia pallens*. Col. by B. Skvortzov, 25, 6. '63.
3. Sao Paulo, along River Pinheiros in a lake. Col. by B. Skvortzov, 24, 12. '63.
4. Sao Paulo, Parque do Estado, in lily pond. Col. by B. Skvortzov, 19, 1., 3, 1. '64.
5. Sao Paulo, near Sao Jose, in a rice field. Col. by Prof. Samuel Branco and B. Skvortzov, 13, 2. '64.
6. Sao Paulo, Parque do Estado, in a swamp. Col. by Skvortzov, 17, 6. '64.
7. " " " 21, 6. '64.

* Instituto de Botanica, Sao Paulo, Brasil.

** Dept. Biol., Fac. Sci., Niigata Univ., Japan. 新潟大学理学部生物学教室.

8. Sao Paulo, along River Pinheiros in a polluted lake. Col. by B. Skvortzov, 30, 12. '64.
9. Sao Paulo, Parque do Estado, in a pond. Col. by B. Skvortzov, 28, 12. '64.
10. " " Zoologico lake. " 11, 1. '65.
11. " " " " 20, 2. '65.
12. " , Cipo, in a mountain swampy stream. Col. V. Alin and B. Skvortzov, 21, 6. '65.
13. " , Parque do Estado, in a swamp near bamboo growth. Col. by B. Skvortzov, 21, 7. '65.
14. " " " " 25, 7. '65.
15. " " , among *Utricularia pallens* in a pond. Col. by B. Skvortzov, 3, 3. '66; 15, 3. '66.

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Description of genus *Vacuolaria* (Cienk.) Nob.

Free-swimming cells spherical, ovoid, pyriform, oblong or fusiform of light green or yellowish green in colour. Periplast hyaline with pronounced metaboly. Two flagella of unequal length, one swimming, another trailing. In some species the flagella are very thin and indistinct, in another thick. Reservoir has a compound system of contractile vacuoles which forms a pusula. Pusula very distinct or indistinct, in form spherical, oblong or triangular. Eyespot, pyrenoids, paramylum granules and haematochrom not present in the cell of *Vacuolaria*. Small and large oildrops very common. The most typical for this genus are numerous refractory granules under the periplast. The number and the size of those granules varies and in some species they lack or are indistinct. The chloroplasts are numerous discs or ellipsoids close to refractory granules and periplast. The colour of chloroplasts is of yellowish-green and very rare green. The nucleus is usually central in position, of relatively large size. Motion rotate forward. Division may take place while the

cells are motile, or after they have come to rest. Usually the division was observed in cells surrounded by a gelatinous envelope. Cysts or thick-walled resting cells have not been observed. In subtropics of Brasil, around Sao Paulo elevated about 600 to 700 m from the sea level *Vacuolaria* is found in waters rich in organic matter, as in pools, ponds, artificial lakes and numerous in May-August the coldest time of the year.

Key to species

1. Refractory granules indistinct or not present..... 2
1. Refractory granules present and distinct..... 4
2. Swimming cell subspherical, chloroplasts discs, more or less spherical
.....1. *Vacuolaria aquae-ferrea*
2. Swimming cells ovoid or ellipsoid..... 3
3. Cells ovoid, slightly depressed.....2. *V. novo-munda*
3. Cells longer, strong depressed.....3. *V. depressa*
4. Chloroplasts green, not yellowish-green, short bacilliform.....4. *V. brasiliana*
4. Chloroplasts yellowish-green 5
5. Refractory granules present and distinct..... 7
5. Chloroplasts round discs, cell subspherical, truncate on the anterior part
.....1. *V. aquae-ferrea*
5. Chloroplasts ovoid or ellipsoid 6
6. Swimming cells slightly depressed2. *V. novo-munda*
6. Swimming cells strongly depressed.....3. *V. depressa*
7. Chloroplasts green, not yellowish-green of ovoid form.....4. *V. brasiliana*
7. Chloroplasts yellowish-green, not green 8
8. Chloroplasts discs 9
8. Chloroplasts bacilliform or ellipsoid13
9. Pusula triangular in form10
9. Pusula subspherical in form11
10. Cells subovoid or subcordate.....5. *V. viridis*
10. Cells ellipsoid or elongate-ovate.....6. *V. dangeardii*
11. Cells subspherical or broad elliptical12
11. Cells ellipsoid7. *V. skujae*
12. Cells subspherical, chloroplasts 3-4 micr. in diam.....8. *V. vulgaris*
12. Cells broad elliptical or ovoid, chloroplasts 1-1.5 micr. in diam.
.....9. *V. montana*

13. Swimming flagellum thick, tailing thin.....10. *V. virescens*
 13. Both flagella thin14
 14. Pusula triangular in shape11. *V. latviensis*
 14. Pusula subspherical or ellipsoid.....15
 15. Pusula broad ovoid or spherical12. *V. pringsheimii*
 15. Pusula ovoid or ellipsoid.....16
 16. Cells fusiform with more or less acute end.....13. *V. fusiformis*
 16. Cells oblong with obtuse lobate end14. *V. lobata*

The type specimens are preserved at the Cryptogamical Section of Botanical Institute, Sao Paulo, Brasil.

Description of species

1. **Vacuolaria aquae-ferrea** sp. nov. (Fig. 1: 3)

Cellula natans subsphaerica, parte anteriore truncata, parte posteriore plus minus attenuata et rotundata, 30-35-45×28-35 micr. Granulis refractis nullo. Chloroplastes discoideus flaveolo-viridis. Flagella 2 tenussimae fere cellulae longiora. Hab. 9.

2. **Vacuolaria novo-munda** sp. nov. (Fig. 1: 1)

Cellula fronte visa ovoidea vel late ellipsoidea, latere elongata et depressa, 24-26×12-15 micr. Flagella 2 in apice in depressione insertis. Chloroplastes luteolo-viridis, ellipsoideus, 4-4.5×1.5-2 micr. Granulae periphericae luce refractae nullo. Guttiae olei major. Pusula sphaerica et distincta. Flagella fere 2/3 cellulae longiora. Hab. 9, 13, 14.

3. **Vacuolaria depressa** sp. nov. (Fig. 1: 2)

Cellula fronte visa ovalis, parte anteriore angustior cum depressione, parte posteriore late rotundata. Cellula 26-55×15-35 micr. Granulae refractae non vidi. Chloroplastes luteolo-viridis, ellipsoideus et numerosus. Guttiae olei magnae. Pusula subtriangulata. Flagella fere 2/3 cellulae longiora. Hab. 9, 13.

4. **Vacuolaria brasiliana** sp. nov. (Fig. 1: 4)

Cellula natans ovalis, 30-37×25-30 micr. Flagella 2 similis, 2/3 cellulae longiora. Periplastes hyalinus et levis cum granuli refractis periphericis sparsis. Chloroplastes ellipsoideus, viridis non luteolo-viridis, 3-4 micr. in diam. Pusula subsphaerica. Hab. 10-12.

5. **Vacuolaria viridis** (Dang.) Sann. (Fig. 1: 5) (according Lemmermann) in Popova, T. Euglenophyta in the Key of fresh-water Algae of USSR. Fasc. 7 (1955) p. 264-265 fig. 117-(2, 3).

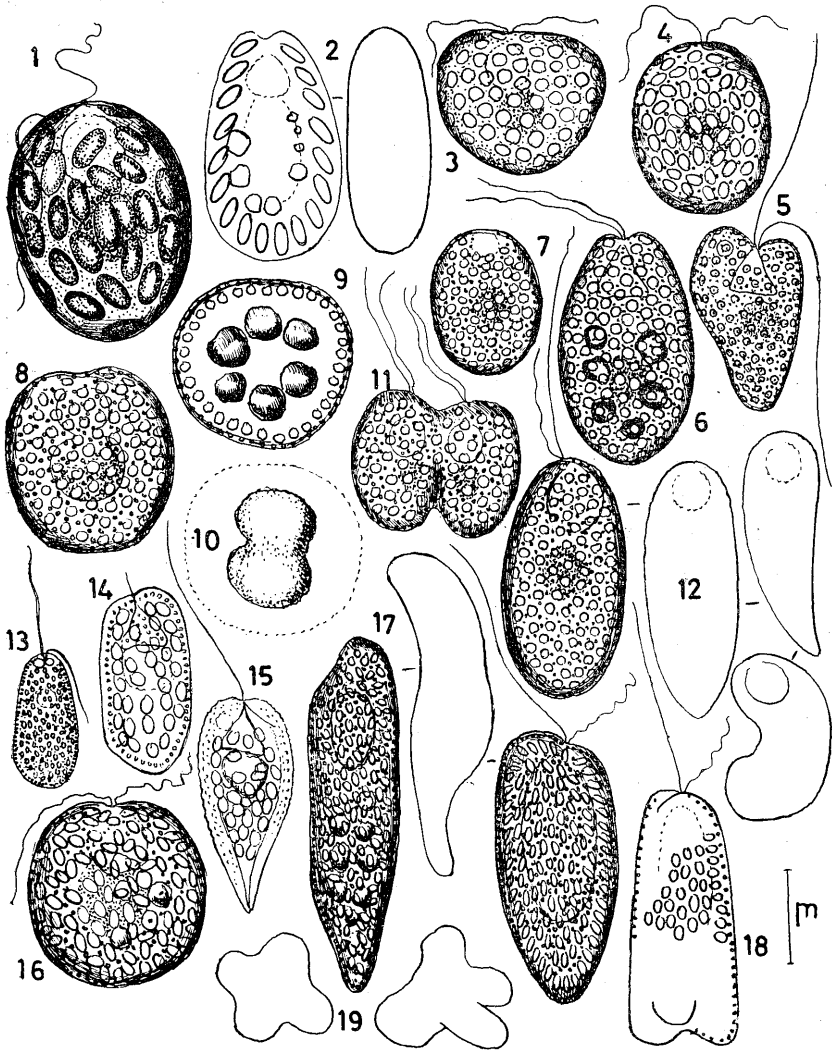


Fig. 1. Species of *Vacuolaria*. 1. *Vacuolaria novo-munda* 2. *V. depressa* 3. *V. aquae-ferrea* 4. *V. brasiliiana* 5. *V. viridis* 6. *V. dangeardii* 7. *V. montana* 8-11. *V. vulgaris* (9-section view, oil drops in the middle, 10-cell division in resting stage, 11-cell division in motion) 12. *V. skujae* 13. *V. virescens* 14-15. *V. latviensis* 16. *V. pringsheimii* 17. *V. fusiformis* 18-19. *V. lobata* (18-swimming cell, 19-resting cells in gelatine)

Swimming cells subpyriform, $42-60 \times 31-39$ micr. Anterior part enlarged and constricted in the middle part, posterior part attenuate and on the end broad rounded. Periplast thin with numerous peripheral refracted granules. Chloroplasts small round discs about $2-3$ micr. in diam. Flagella 2, not equal, principal about the cell length, secondary 1.5 of the cell length. Pusula triangular and large. Nucleus central. Cells in palmella stage about $20-40$ micr. in diam. Hab. Reported from western part of Europe.

6. **Vacuolaria dangeardii** sp. nov. (Fig. 1: 6)

Cellula natans ellipsoidea, pyriformis, elongato-ovoidea, $48-58 \times 26-30$ micr. Flagella 2 tenuissima, $2/3$ cellulae longiora. Periplastes hyalinus et metabolicus. Cytoplasmates cum granulis periphericis refractis numerosi. Chloroplastes discisus flavo-viridescens, 3.5 micr. in diam. Pusula triquetra et magna. Nucleus inframedianus. Dixi hanc species in memoriam clari botanici Prof. G. Dangeard, France. Hab. 4.

7. **Vacuolaria skujae** sp. nov. (Fig. 1: 12)

Cellula natans ovata, pyriformis, ellipsoidea, fusiformis, reniformis, $40-55-62-74-111 \times 18-22-33-45$ micr., sulco curto interdum parte anteriore prope pusula. Pusula distincta sphaerica. Flagella 2 dissimularis, postico cellulae aequilongo vel longiore, alterno minimo circa $1/2$ cellulae longitudinis. Periplastes levis et metabolicus. Granula refracta periphericis numerosa vel sparsa. Chloroplastes flavo-viridescens $2-3-4$ micr. diam. Guttae olei minor vel major supramediana vel infra mediano dispositae. Nucleus $10-13$ micr. in diam., sphaericus et punctatus. Dixi in honorem clari algologi Prof. H. Skuja, Sweden. Hab. 4, 5.

8. **Vacuolaria vulgaris** sp. nov. (Fig. 1: 8-11)

Cellula natans, ovoidea, pyriformis, subsphaerica, semiquadrata vel oblonga, $35-44-55-70 \times 44-55$ micr. Flagella 2 tenuissima fere $1/2-3/4$ cellulae longiora in depressione cellulae insertae. Periplastes hyalinus, levis, metabolicus, rarius in statu immobili indistincte spiraliter stratis. Cytoplasmates cum granulis refractis plus minus distinctis numerosi vel sparsi. Chloroplastes discoideus flavo-viridescens $2-3-4$ micr. diam. Guttae olei in statu immobili magnae et numerosae. Vacuola sphaerica. Nucleus centralis. Hab. 3, 1, 10.

9. **Vacuolaria montana** sp. nov. (Fig. 1: 7)

Cellula in statu quietes ovalia vel late ellipsoidea cum apicibus equalibus late rotundata, $26-35 \times 22-25$ micr. Flagella non vidi. Vacuolae contractiles $1-2$ apice. Periplastes hyalinus et levis. Cytoplasmates cum granulis refractis periphericis numerosi, $1-1.5$ micr. in diam. Chloroplastes discisus etiam minor. Nucleus non vidi.

Cellulae in status quietis in muco amorpho insertae. Hab. 12.

10. **Vacuolaria virescens** Cienk. (Fig. 1: 13)

In Popova, T. Euglenophyta in the Key of freshwater Algae of USSR. Fasc. 7 (1955) p. 263-264 fig. 117-(1).

Cells oblong ovoid with broad rounded ends, $49-85 \times 20-29-38$ micr. Periplast hyaline and strong metabolic. Contractile vacuoles several. Pusula not seen. Flagella 2, thick, almost similar, $2/3$ of the cell length. Refractory granules numerous and distinct. Chloroplasts of light yellowish-green colour, small, short ellipsoid forming one layer under the periplast. Nucleus spherical in anterior part of the cell. Palmella stage and resting spores are known. Cell division in immobile state. Hab. In swamps and in detritus. Dist. Europe, Russia, in Western Siberia near City Tomsk.

11. **Vacuolaria latviensis** (Skuja) nom. nov. (Fig. 1: 14, 15) (according Skuja)

Vacuolaria sp. in H. Skuja, Vorarbeiten zu einer Algen flora von Lettland. 1 (1926) p. 50-51 Abb. 4 fig. 24.

Cellula natans oblonga cum marginis fere parallela, apice oblique et contracta, postice late acuta et obtusa. Dimensione nullo. Cytoplasmates granulosi. Chloroplastes ellipsoideus numerosus, magnus in series longitudinalis dispositus. Pusula triquetra. Flagellum principale robustum. Hab. in fossa dolomitica prope Riga, Latvia.

12. **Vacuolaria pringsheimii** sp. nov. (Fig. 1: 16)

Cellula subsphaerica, ovoidea, reniformis, $37-40-48$ micr. longa. Flagella dissimilaribus tenuis. Periplastes levis et metabolicus. Cytoplasmates cum granulis periphericis refractis numerosi. Chloroplastes ellipsoideus, fere $3-4 \times 1.5-2$ micr. et guttae olei fere sphaericus $3-7$ micr. in diam. Pusula rotundata. Nucleus magnus et sphaericus. Dixi in honorem clari algologi Prof. E.G. Pringsheim, Göttingen, Germany. Hab. 3, 4, 14.

13. **Vacuolaria fusiformis** sp. nov. (Fig. 1: 17)

Cellula fusiformis vel elongato-ovoidea. $37-40-55-74 \times 15-22-30$ micr. Flagella 2 dissimilares, tenuis, in depressione subapicem in latere ventrali inserti, altero fere cellulae longitudine, altero circa dimidium cellulae longitudinis habente. Periplastes levis et metabolicus. Granula refracta periphericis numerosa. Chloroplastes ellipsoideus fere $3-4 \times 2$ micr. seriatim in latere dispositus. Vacuola sphaerica. Nucleus fere parte posteriore. Hab. 4, 9.

14. **Vacuolaria lobata** sp. nov. (Fig. 18, 19)

Cellula natans elongata cum parte anteriore rotundata, parte posteriore late obtusa, 3-4 lobata, ventraliter plusminus applanata et plerumque cum sulco vadoso longitudinali in parte anteriore modo distincta, 55×14 micr. Flagella 2 dissimilares, principale directa, natans vel forte curvata, natans cellulae longiora, secundare tenuis duplo brevius. Cytoplasmates cum granulis periphericis refractis numerosos. Chloroplastes in fronte visa rotundatus, in latere vel sectione visa ellipsoideus seriatim in latere dispositus. Pusula subsphaerica. Nucleus fere centralis, status quietis in muco amorpho cum cellulis semper sexangulari vel 3-4-lobato (Fig. 1: 19). Hab. 5, 6, 7.

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著者らは1962—1966年間17回に亘って調査研究したブラジル産の *Vacuolaria* (Euglenophyta, Chloromonadaceae) の種類について記載した。ブラジル産は、特殊な生育地に限られて分布する既知のヨーロッパ産の種類とは異なり、本文には、ブラジル産11新種と既知のヨーロッパ産3種をも含めて記載、図示した。

○外来のナデシコ一種 (久内清孝) Kiyotaka HISAUCHI: A new alien in Japan

長野県東筑摩郡本郷村に在住の奥原弘人氏は、西筑摩郡日義村宮ノ越の国道沿線で、1967年9月2日に外来のナデシコをとられた。この草は既に那須御用邸の方々により採集され、*Dianthus Armeria* L. と考定されているもので、恐らくわが国における2回目のものであろう。花が小さく、従来の習慣で石竹とよばれた型で、ミヤマナデシコ形のものだが、葉その他の部分に毛が生えている。和名はどなたかがつけられていると思うが、公表されたものはないのでノハラナデシコと命じておく。(東邦大学薬学部)

□花の構造 佐竹義輔(監修) pp. 8+8, 40 pl. B 5 版, ¥2,000 少年写真新聞社。花の写真を大きく引き伸して読者に提供しようという試みは、丁度ライカ・カメラが出現した頃、Paul Wolff によって *Formen der Leben* という題目で、1930年に出版されたのが初まりではないかと思われる。本書は花、特にその部分、断面などを白黒の写真に拡大して、顕花植物の多様性を生き生きと見せ、教育上、花のより深い理解のために企画されている。各写真は厚い紙に載り、1枚ずつは必ずしも使える。専門家もこれらをじっと見ていて何らかの発見がありそうな写真集である。(津山 尚)